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(54) **Tissue scaffold anchor for cartilage repair**

Anker für Gewebegerüst zur Wiederherstellung von Knorpel

Ancrage d'échafaudage de tissu pour la réparation de cartilage

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## Description

### Field of the Invention

**[0001]** The present invention relates to scaffold fixation devices useful in articular cartilage repair and more specifically to a device for fastening an articular cartilage scaffold to underlying bone.

### Background of the Invention

**[0002]** Articular cartilage is a tissue that covers the articulating surfaces between bones in joints, such as the knee or elbow, which is subject to catastrophic or repetitive stress injury. Various means have been proposed to address such injuries including repair via tissue engineering. Tissue engineering is defined as the application of engineering disciplines to either maintain existing tissue structures or to enable new tissue growth. This engineering approach generally includes the delivery of a tissue scaffold that serves as an architectural support onto which cells may attach, proliferate, and synthesize new tissue to repair a wound or defect. Surgical use of a tissue scaffold requires a fixation means to secure the scaffold to the bone beneath the wounded cartilage site. Secure fixation of the scaffold within the wound site is necessary for proper healing.

**[0003]** Frequently, scaffolds, prostheses and fasteners used in orthopedic applications are made from synthetic absorbable biocompatible polymers which are well known in the art. Such polymers typically are used to manufacture medical devices which are implanted in body tissue and absorb over time. Synthetic, absorbable, biocompatible aliphatic polyesters include homopolymers, copolymers (random, block, segmented and graft) of monomers such as glycolic acid, glycolide, lactic acid, lactide(d, l, meso and mixtures thereof), ε-caprolactone, trimethylene carbonate and p-dioxanone. Numerous U.S. Patents describe these polymers, including 5,431,679; 5,403,347; 5,314,989 5,431,679; 5,403,347; and 5,502,159. Devices made of an absorbable material have the advantage that they are absorbed by the body after healing has occurred.

**[0004]** U.S. Patent 5,067,964 describes an articular cartilage repair piece which includes a backing layer of non-woven, felted fibrous material which is either uncoated or covered by a coating of tough, pliable material. A number of means are disclosed for fastening the repair piece to the underlying bone. U.S. Patents 5,306,311 and 5,624,463 describe a prosthetic, resorbable articular cartilage and methods of its fabrication and insertion. U.S. Patent 5,713,374 describes an attachment method to hold a biomaterial in place until healing occurs. U.S. Patents 5,632,745 and 5,749,874 and 5,769,899 describe a bioabsorbable cartilage repair system.

**[0005]** Articular joint loading is very complex, involving high compressive loads combined with high shear loads associated with sliding articulation of the opposing surfaces. A device implanted into the articular joint space must have sufficient strength to withstand these loads. Particularly important is that the device should be fixed in the underlying bone so that it cannot rotate or separate from the bone under the action of high shear loads in the joint space. U.S. Patent 5,749,874 teaches that if vascular invasion and cellular migration is to be effected between the healthy tissue and the scaffold, means must be provided to preclude rotation of the scaffold relative to the fixation device, but does not describe a means of keeping the fixation device itself from rotating in relation to the surrounding tissues or from pulling out.

**[0006]** Accordingly, it would be advantageous to provide a scaffold fixation device which has a fixation means that engages the bone to prevent rotation and separation.

**[0007]** WO 00/24554 discloses a device of the type set forth in the preamble of the accompanying claim 1.

### Summary of the Invention

**[0008]** The limitations of prior art devices for attaching a tissue scaffold to bone tissue are overcome by the present invention which comprises a device for attaching a tissue scaffold to bone tissue as set forth in the accompanying claim 1.

### Brief Description of the Figures

**[0009]**

Figure 1 is a side elevation view of a scaffold fixation device in accordance with an exemplary embodiment of the present invention;

Figure 2 is a perspective view of the device of Figure 1;

Figure 3 is a side elevation view of the device of Figure 1 deployed in bone;

Figure 4 is an exploded view of a second exemplary embodiment of the present invention;

Figure 5 is a side elevation view of the device of Figure 4, assembled; and

Figure 6 is a side elevation view of the device of Figure 4 deployed in bone.

### Detailed Description of the Invention

**[0010]** Figure 1 shows a scaffold fixation device 10 for fastening an articular cartilage scaffold to underlying bone. The device 10 has a scaffold attachment platform 12 with a post 14 extending therefrom at approximately 90°. Depending upon the application, this angular relationship may be varied. Vertical ribs 16 extend along a portion of the length of the post 14 and taper downwards in width and height as they extend from edge 17 to chamfered distal tip 18. The taper of vertical ribs 16 enhances the ability of the vertical ribs 16 to gradually cut into surrounding bone during insertion of scaffold fixation device 10 into an appropriately sized hole in a bone to which the

device 10 is attached. While the ribs 16 shown are in the form of a longitudinally bisected, elongated cone, other tapering shapes could be employed, such as an elongated wedge with or without a knife-edge bevel.

**[0011]** Figure 2 shows a perspective view of scaffold fixation device 10 showing perforations 20 in disk-shaped platform 12 that allow fluid and cells to travel to and from the scaffold promoting cell proliferation and ingrowth. While six triangular perforations 20 are shown in FIG. 2, the perforations 20 can be any number, size or shape, e.g., circular or trapezoidal and accordingly are not limited to the shape or arrangement shown in the figures. A guide wire channel 22 extends longitudinally through fixation device 10 along the axis of post 14. As is known in the art, a guide wire may be utilized to assist in placing the device 10, viz, by inserting an end of a guide wire into a hole bored in a bone and then threading the device 10 over the guide wire, i.e., via channel 22, such that the post 14 enters the hole in the bone (See FIG. 3).

**[0012]** Figure 3 shows a side elevation view of scaffold fixation device 10 which has been surgically positioned within a hole 40 drilled in bone tissue 42. The diameter of the hole 40 is selected such that an interference fit is made between the hole 40 and post 14 with vertical ribs 16. That is, hole 40 has diameter which is less than the outermost diameter of vertical ribs 16. Preferably, hole 40 has a diameter that is the same as or slightly smaller than the outermost diameter (root diameter) of post 14 (not including ribs 16). The scaffold fixation device 10 is preferably fabricated from a material that is sufficiently unyielding such that post 14 and vertical ribs 16 have sufficient radial stiffness and strength to cause the vertical ribs 16 to cut into the bone tissue 42 surrounding the hole 40. This intrusion into the bone 42 has the effect of rotationally fixing the scaffold fixation device 10 to the bone tissue 42. In addition, axial fixation of the device 10 is achieved by vertical ribs 16, the sharp edges 17 of which engage trabecular bone tissue 42 when subjected to an axial force which would otherwise pull the scaffold fixation device 10 out of the hole 40 in the bone 42. A hole 44 is drilled in cartilage tissue 46 with a diameter at least as large as the outermost diameter of platform 12 to accommodate the platform 12 therein in a position permitting the scaffold 47 (shown diagrammatically in dotted lines and displaced slightly) to be attached to the device 10 by sutures or adhesives, in a known manner. The depths of hole 40 in the bone and the hole 44 in the cartilage are selected such that, when post 14 is inserted completely into hole 40, upper surface 50 of platform 12 is in alignment with or slightly below upper surface 52 of the bone tissue 42, i.e., the platform 12 may be countersunk into the bone 42. The scaffold 47 is accommodated within hole 44 in the cartilage (between platform 12 and upper cartilage surface 54). Post 14 may also have a chamfered lower edge 18 which aids in guiding post 14 into the hole 40 in the bone tissue 42. As noted above, a surgical guide wire may be passed through guide wire channel 22 during surgery to align scaffold fixation device 10 with bone hole 40. The fixation device 10 may be made from a non-porous material or from materials that are partially or wholly porous to allow cell invasion into the device.

**[0013]** A two-piece embodiment of the invention is shown in Figures 4 through 6, which show a two-piece scaffold fixation device 130 similar to a device described in EP-A-1 129 675,

**[0014]** Figures 14 through 20 and the associated description thereof being particularly relevant in describing the interlocking relationship displayed by a two-piece scaffold fixation device.

**[0015]** Figure 4 shows a two-piece scaffold fixation device 130 with top component 132 and fixation component 134. The top component 132 has a scaffold attachment platform 112 from which extends a coupling pin 114 with a pair of latches 116, 118 projecting from corresponding resilient arms 120, 122. The coupling pin 114 telescopes into a mating axial bore 124 in the fixation component 134, with the latches 116, 118 clipping over an internal ledge 126 when the pin 114 is pressed fully home into the bore 124. The fixation component 134 has vertical anchoring ribs 180 having a similar form and function as the vertical ribs 16 shown in Figures 1-3. The ribs 180 are disposed about the outer peripheral surface of cylindrically shaped anchor section 148 of the fixation component 134. Figure 5 shows the scaffold fixation device 130 with the top component 132 and fixation component 134 assembled.

**[0016]** Figure 6 shows scaffold fixation device 130 after having been surgically inserted in bone tissue 162, showing the vertical anchoring ribs 180 embedded in the bone tissue 162 surrounding hole 160 to prevent rotation of fixation component 134 within the hole 160. The device 130 would be utilized for attaching a scaffold (see FIG. 3) to a bone 162 by boring a suitable hole 160 in the bone 162. The fixation component 134 is inserted into the hole 160 and driven home. The coupling pin 114 of the top component 132 can then be inserted into bore 124 of the fixation component and pressed in until the latches 116, 118 latch over ledge 126 (See FIG. 4).

**[0017]** Although Figures 1-6 show a certain number and shape of vertical ribs 16 and vertical anchoring ribs 180, those skilled in the mechanical arts will appreciate that various numbers and shapes of ribs 16, 180 protruding from post 14 or anchor section 148 will create a non-circular cross-section along at least a portion of post 14 or anchor section 148 and result in rotational and axial fixation in bone. Fixation device 130 may be either solid or partially or wholly porous to allow cell invasion into the device.

**[0018]** Suitable materials from which the scaffold fixation device 10, 130 may be formed include biocompatible polymers such as aliphatic polyesters, polyorthoesters, polyanhydrides, polycarbonates, polyurethanes, polyamides and polyalkylene oxides. The present invention also can be formed from absorbable polymers, glasses or ceramics comprising calcium phosphates and other

biocompatible metal oxides (i.e., CaO), metals, combinations of metals, autograft, allograft, or xenograft bone tissues.

**[0019]** In the preferred embodiment, the scaffold fixation device 10, 130 is formed from aliphatic polymer and copolymer polyesters and blends thereof. The aliphatic polyesters are typically synthesized in a ring opening polymerization. Suitable monomers include but are not limited to lactic acid, lactide (including L-, D-, meso and D, L mixtures), glycolic acid, glycolide, ε-caprolactone, p-dioxanone (1,4-dioxan-2-one), trimethylene carbonate (1,3-dioxan-2-one), delta-valerolactone, beta-butyrolactone, epsilon-decalactone, 2,5-diketomorpholine, pivalolactone, alpha, alpha-diethylpropiolactone, ethylene carbonate, ethylene oxalate, 3-methyl-1,4-dioxane-2,5-dione, 3,3-diethyl-1,4-dioxan-2,5-dione, gamma-butyrolactone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one, 6,6-dimethyl-dioxepan-2-one, 6,8-dioxabicycloctane-7-one and combinations thereof. These monomers generally are polymerized in the presence of an organometallic catalyst and an initiator at elevated temperatures. The organometallic catalyst is preferably tin based, e.g., stannous octoate, and is present in the monomer mixture at a molar ratio of monomer to catalyst ranging from about 10,000/1 to about 100,000/1. The initiator is typically an alkanol (including diols and polyols), a glycol, a hydroxy-acid, or an amine, and is present in the monomer mixture at a molar ratio of monomer to initiator ranging from about 100/1 to about 5000/1. The polymerization typically is carried out at a temperature range from about 80°C to about 240°C, preferably from about 100°C to about 220°C, until the desired molecular weight and viscosity are achieved.

**[0020]** In another embodiment of the present invention, the polymers and blends from which it is formed can be used as a therapeutic agent release matrix. Prior to forming the device 10, 130, the polymer would be mixed with a therapeutic agent. The variety of different therapeutic agents that can be used in conjunction with the polymers of the present invention is vast. In general, therapeutic agents which may be administered via the pharmaceutical compositions of the invention include, without limitation: antiinfectives such as antibiotics and antiviral agents; chemotherapeutic agents (i.e. anticancer agents); anti-rejection agents; analgesics and analgesic combinations; anti-inflammatory agents; hormones such as steroids; growth factors, including bone morphogenic proteins (i.e. BMP's 1-7), bone morphogenic-like proteins (i.e. GFD-5, GFD-7 and GFD-8), epidermal growth factor (EGF), fibroblast growth factor (i.e. FGF 1-9), platelet derived growth factor (PDGF), insulin like growth factor (IGF-I and IGF-II), transforming growth factors (i.e. TGF-β I-III), vascular endothelial growth factor (VEGF); and other naturally derived or genetically engineered proteins, polysaccharides, glycoproteins, or lipoproteins. The foregoing growth factors are known to those with skill in the art and described in The Cellular and Molecular Basis of Bone Formation and Repair by Vicki Rosen and R. Scott Thies, published by R.G. Landes Company.

**[0021]** Matrix materials for the present invention may be formulated by mixing one or more therapeutic agents with the polymer. Alternatively, a therapeutic agent could be coated on to the polymer, preferably with a pharmaceutically acceptable carrier. Any pharmaceutical carrier can be used that does not dissolve the polymer. The therapeutic agent may be present as a liquid, a finely divided solid, or any other appropriate physical form. Typically, but optionally, the matrix will include one or more additives, such as diluents, carriers, excipients, stabilizers or the like.

**[0022]** The amount of therapeutic agent will depend on the particular drug being employed and medical condition being treated. Typically, the amount of drug represents about 0.001 percent to about 70 percent, more typically about 0.001 percent to about 50 percent, most typically about 0.001 percent to about 20 percent by weight of the matrix. The quantity and type of polymer incorporated into the drug delivery matrix will vary depending on the release profile desired and the amount of drug employed.

**[0023]** Upon contact with body fluids, the polymer undergoes gradual degradation (mainly through hydrolysis) with concomitant release of the dispersed drug for a sustained or extended period. This can result in prolonged delivery (over, say I to 5,000 hours, preferably 2 to 800 hours) of effective amounts (say, 0.0001 mg/kg/hour to 10 mg/kg/hour) of the drug. This dosage form can be administered as is necessary depending on the subject being treated, the severity of the affliction, the judgment of the prescribing physician, and the like. Following this or similar procedures, those skilled in the art will be able to prepare a variety of formulations.

## Claims

1. A device (10) for attaching a tissue scaffold to bone tissue, comprising:

   a platform (12) positionable in substantially parallel relationship to the bone tissue for retaining the tissue scaffold proximate to the bone tissue;
   a post (14) extending from the platform, said post insertable into a hole (40) formed in the bone tissue (42); and
   at least one rib (16) extending from a surface of said post (14) along a portion of the length of said post from a first point distal to said platform (12) to a second point intermediate said first point and said platform, said at least one rib (16) having a cross-sectional area that increases along the length of said rib in the direction from said first point to said second point, said at least one rib establishing an interference fit relative to the hole (40) in the bone tissue (42) to prevent rotation of said device relative to the bone tissue,

wherein said at least one rib (16) has a diverging surface that diverges from the surface of said post (14) in the direction from said first point to said second point, said at least one rib terminating proximate said second point in a sharp edge (17), said edge positionable within said hole (40) for gripping the bone tissue (42) to resist withdrawal of said device from the hole, **characterised in that**
said rib (16) expands in width in the direction from said first point to said second point.

2. The device of Claim 1, wherein said at least one rib (16) has a shape approximating a portion of an elongated cone.

3. The device of Claim 1 or Claim 2, wherein said at least one rib (16) is a plurality of ribs disposed about the outer peripheral surface of said post (14).

4. The device of Claim 1, 2 or 3 wherein said post (14) has a chamfered end (18) to aid in the introduction of said post into the hole (40) in the bone tissue (42).

5. The device of any preceding Claim, wherein said device (10) has a guide wire hole (22) extending axially there through to permit said device to be slipped over a guide wire having one end thereof positioned in the hole (40) for guiding said device into the hole.

6. The device of any preceding Claim 4, wherein said post (14) extends from said platform (12) at about 90 degrees.

7. The device of any preceding Claim, wherein said platform (12) has a perforation (20) therein to allow fluid and cell transmission through said perforation.

8. The device of any preceding Claim, wherein said device (10) is formed from a material selected from the group consisting of biocompatible polymers, absorbable polymers, glasses, ceramics, metal oxides, bone tissue and therapeutic agents, alone or in combination.

9. The device of any preceding Claim 11, wherein said platform (12) and said post (14) are monolithically formed.

10. The device of any of Claims 1 to 8, wherein said platform (112) and said post (134) are independently formed elements.

11. The device of Claim 10, wherein said platform (112) has a coupling pin (114) extending from a surface thereof, said post (134) having a hollow (124) therein for matingly receiving said coupling pin to couple said platform and said post.

12. The device of Claim 11, further including a latch (116,118) resiliently mounted on said coupling pin (114) said latch having a locking position and a withdrawn position, said latch permitting said coupling pin to be inserted into said hollow (124) in said post (134) in a coupling relationship with said post when in said withdrawn position and retaining said coupling pin (114) coupled to said post (134) in said locking position.

**Patentansprüche**

1. Vorrichtung (10) zum Anbringen eines Gewebegerüsts an Knochengewebe, umfassend:

eine Plattform (12), die zum Halten des Gewebegerüsts in der Nähe des Knochengewebes in im wesentlichen paralleler Beziehung zum Knochengewebe positionierbar ist,
einen Stift (14), der sich von der Plattform erstreckt, wobei der Stift in ein in dem Knochengewebe (42) ausgebildetes Loch (40) einsetzbar ist, und
mindestens eine Rippe (16), die sich von einer Oberfläche des Stifts (14) entlang eines Teils der Länge des Stifts von einem ersten Punkt distal zur Plattform (12) zu einem zweiten Punkt zwischen dem ersten Punkt und der Plattform erstreckt, wobei die mindestens eine Rippe (16) eine Querschnittsfläche aufweist, die entlang der Länge der Rippe in der Richtung vom ersten Punkt zum zweiten Punkt zunimmt, wobei die mindestens eine Rippe eine Preßpassung relativ zum Loch (40) im Knochengewebe (42) erzeugt, um eine Drehung in der Vorrichtung relativ zum Knochengewebe zu verhindern,
wobei die mindestens eine Rippe (16) eine divergierende Oberfläche aufweist, die von der Oberfläche des Stiftes (14) in der Richtung vom ersten Punkt zum zweiten Punkt divergiert, wobei die mindestens eine Rippe in der Nähe des zweiten Punktes in einer scharfen Kante (17) endet, wobei die Kante in dem Loch (40) positionierbar ist, um das Knochengewebe (42) zu ergreifen und Herausziehen der Vorrichtung aus dem Loch Stand zu halten, **dadurch gekennzeichnet, daß** sich die Rippe (16) in der Breite in der Richtung vom ersten Punkt zum zweiten Punkt erweitert.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** die mindestens eine Rippe (16) eine Gestalt aufweist, die einem Teil eines länglichen Kegels ähnelt.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** die mindestens eine Rippe (16)

eine Anzahl von Rippen ist, die um die äußere Umfangsfläche des Stiftes (14) angeordnet sind.

4. Vorrichtung nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, daß** der Stift (14) ein abgeschrägtes Ende (18) als Hilfe beim Einsetzen des Stiftes in das Loch (40) im Knochengewebe (42) aufweist.

5. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Vorrichtung (10) ein Führungsdrahtloch (22) aufweist, das sich dort hindurch axial erstreckt, um zu ermöglichen, daß die Vorrichtung über einen Führungsdraht schiebbar ist, der ein Ende aufweist, das zum Führen der Vorrichtung in dem Loch positioniert ist.

6. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** sich der Stift (14) von der Plattform (12) unter ungefähr 90 Grad erstreckt.

7. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Plattform (12) eine Perforation (20) aufweist, um Durchlaß von Flüssigkeit und Zellen durch die Perforation zu ermöglichen.

8. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Vorrichtung (10) aus einem Material ausgebildet ist, das aus der Gruppe ausgewählt ist, die aus biokompatiblen Polymeren, absorbierbaren Polymeren, Gläsern, Keramiken, Metalloxiden, Knochengewebe und therapeutischen Mitteln, einzeln oder in Kombination, besteht.

9. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Plattform (12) und der Stift (14) monolithisch ausgebildet sind.

10. Vorrichtung nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, daß** die Plattform (112) und der Stift (134) unabhängig ausgebildete Elemente sind.

11. Vorrichtung nach Anspruch 10, **dadurch gekennzeichnet, daß** die Plattform (112) einen Kopplungsstift (114) aufweist, der sich von einer Oberfläche derselben erstreckt, wobei der Stift (134) einen Hohlraum (124) zur ineinanderpassenden Aufnahme des Kopplungsstiftes zum Koppeln der Plattform und des Stiftes aufweist.

12. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, daß** sie ferner einen Sperrhaken (116, 118) enthält, der an dem Kopplungsstift (114) federnd montiert ist, wobei der Sperrhaken eine Sperrposition und eine Herausnahmeposition aufweist, wobei der Sperrhaken ermöglicht, daß der Kopplungsstift in den Hohlraum (124) in dem Stift (134) in einer Kopplungsbeziehung mit dem Stift in der Herausnahmeposition einsetzbar ist, und den Kopplungsstift (114) in der Sperrposition mit dem Stift (134) gekoppelt hält.

## Revendications

1. Dispositif (10) servant à fixer une structure d'échafaudage tissulaire sur un tissu osseux, comprenant :

   - une plate-forme (12) positionnable dans une relation sensiblement parallèle au tissu osseux, pour retenir la structure d'échafaudage tissulaire à proximité du tissu osseux ;
   - un support (14) s'étendant depuis la plate-forme, ledit support pouvant être inséré dans un trou (40) formé dans le tissu osseux (42) ; et
   - au moins une nervure (16) s'étendant depuis une surface dudit support (14) le long d'une partie de la longueur dudit support, depuis un premier point distal de ladite plate-forme (12) jusqu'à un deuxième point situé entre ledit premier point et ladite plate-forme, ladite nervure (16) au moins une ayant une section transversale qui augmente en suivant la longueur de ladite nervure dans la direction allant dudit premier point audit deuxième point, ladite au moins une nervure établissant un ajustement serré par rapport au trou (40) formé dans le tissu osseux (42), pour empêcher une rotation dudit dispositif par rapport au tissu osseux,

   dans lequel ladite au moins une nervure (16) a une surface qui s'écarte de la surface dudit support (14) dans la direction allant dudit premier point jusqu'audit deuxième point, ladite au moins une nervure se terminant à proximité dudit deuxième point en formant un bord vif (17), ledit bord étant positionnable à l'intérieur dudit trou (40) pour saisir le tissu osseux (42), afin de résister au retrait dudit dispositif par rapport au trou, **caractérisé en ce que** ladite nervure (16) s'étend en largeur dans la direction allant dudit premier point jusqu'audit deuxième point.

2. Dispositif selon la revendication 1, dans lequel ladite nervure (16) au moins une a une forme se rapprochant de celle d'une partie d'un cône allongé.

3. Dispositif selon la revendication 1 ou 2, dans lequel ladite au moins une nervure (16) est une pluralité de nervures disposées autour de la surface périphérique extérieure dudit support (14).

4. Dispositif selon les revendications 1, 2 ou 3, dans

lequel ledit support (14) a une extrémité chanfreinée (18) aidant à l'introduction dudit support dans le trou (40) formé dans le tissu osseux (42).

5. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif (10) a un trou (22) pour un fil de guidage s'étendant axialement à travers le dispositif, pour permettre audit dispositif d'être glissé par-dessus un fil de guidage ayant une de ses extrémités positionnée dans le trou (40), pour guider ledit dispositif dans le trou.

6. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit support (14) s'étend depuis ladite plate-forme (12) suivant un angle à peu près égal à 90 degrés.

7. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ladite plate-forme (12) a, à l'intérieur de celle-ci, une perforation (20) pour permettre la transmission de fluide et de cellules à travers ladite perforation.

8. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif (10) est formé dans une matière sélectionnée parmi le groupe de matières se composant de polymères biocompatibles, de polymères absorbables, de verres, de céramiques, d'oxydes métalliques, de tissus osseux et d'agents thérapeutiques, lesdites matières étant utilisées seules ou de façon combinée.

9. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ladite plate-forme (12) et ledit support (14) sont formés de façon monolithique.

10. Dispositif selon l'une quelconque des revendications 6 à 8, dans lequel ladite plate-forme (112) et ledit support (134) sont des éléments formés de façon indépendante.

11. Dispositif selon la revendication 10, dans lequel ladite plate-forme (112) a une goupille de couplage (114) s'étendant depuis une surface de cette plate-forme, ledit support (134) ayant une cavité (124) à l'intérieur dudit support, pour recevoir, par accouplement, ladite goupille de couplage servant à coupler ladite plate-forme et ledit support.

12. Dispositif selon la revendication 11, comprenant en outre un cliquet d'arrêt (116, 118) monté de façon élastique sur ladite goupille de couplage (114), ledit cliquet d'arrêt ayant une position de verrouillage et une position de retrait, ledit cliquet d'arrêt permettant à ladite goupille de couplage d'être insérée à l'intérieur de ladite cavité (124) formée dans ledit support (134), dans une relation de couplage avec ledit support lorsque le cliquet d'arrêt est dans ladite position de retrait, et retenant ladite goupille de couplage (114) couplée audit support (134), dans ladite position de verrouillage.

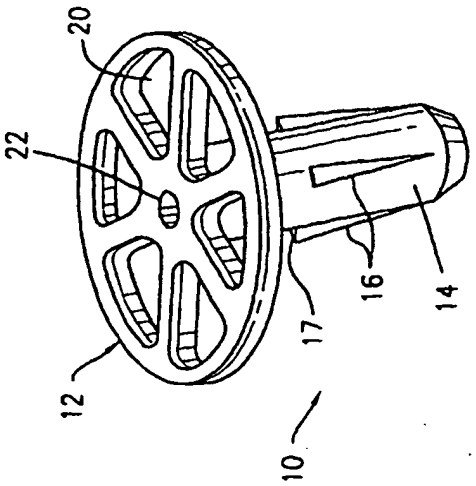


FIG. 2

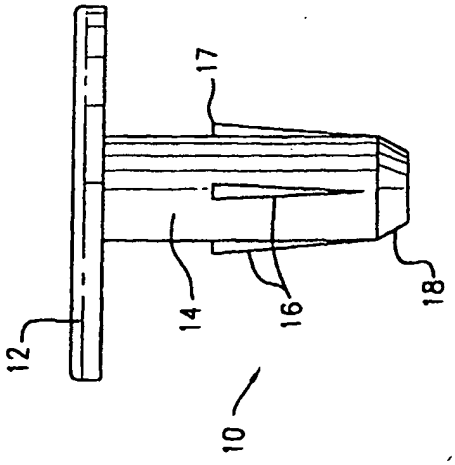


FIG. 1

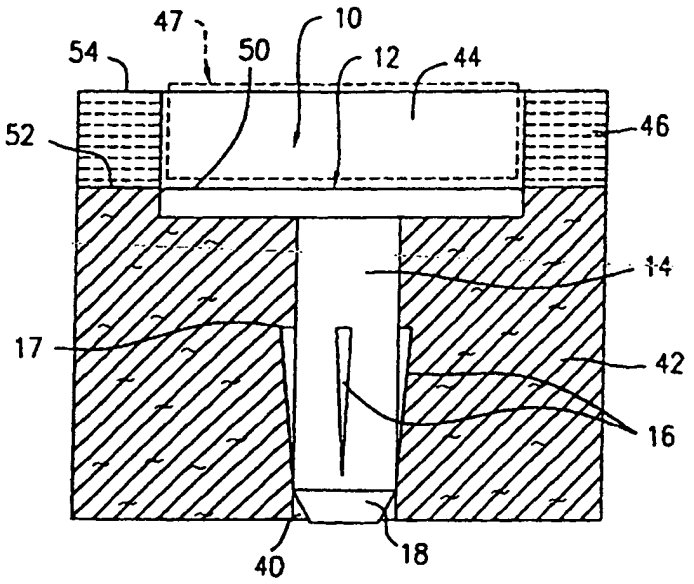


*FIG. 3*

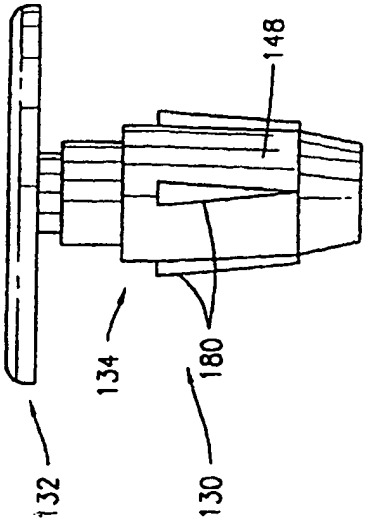
148
134
180
132
130

FIG. 5

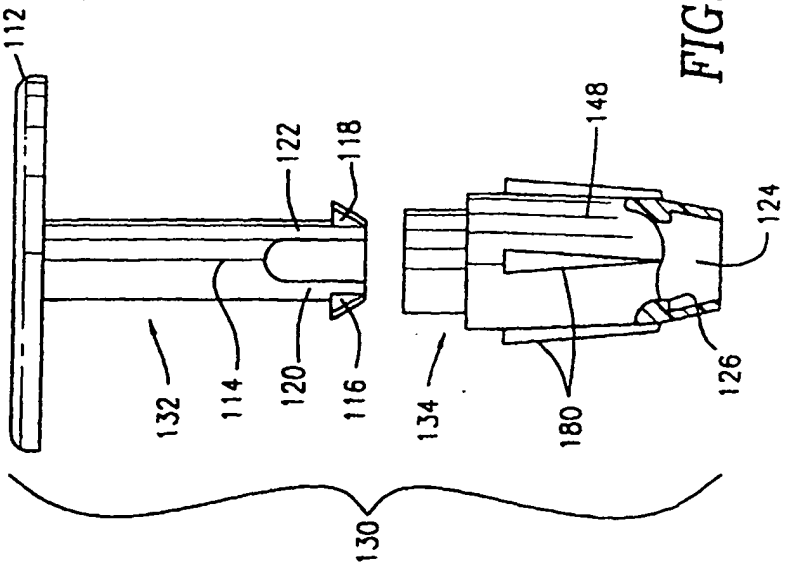
112
122
118
148
124
132
114
120
116
134
180
126
130

FIG. 4

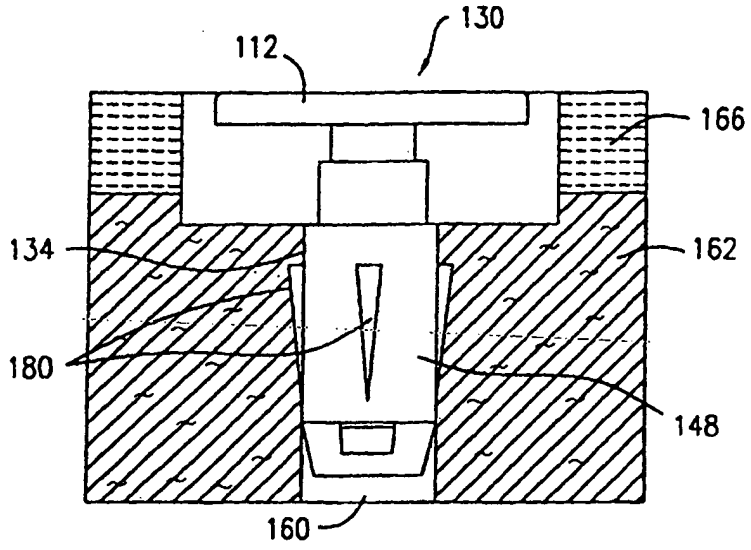


*FIG. 6*